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Application Number	10/628,709
Filing Date	July 28, 2003
First Named Inventor	Atsushi Kono et al.
Art Unit	2835
Examiner Name	Anatoly Vortman
Attorney Docket No.	MAT-8450US

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/Declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
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- ☐ Response to Missing Parts/ Incomplete Application
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- ☐ Appeal Communication to Board of Appeals and Interferences
- ☒ Appeal Communication to TC (**Appeal Notice, Brief, Reply Brief**) (Supplemental Appeal Brief)
- ☐ Proprietary Information
- ☐ Status Letter
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Remarks:

SIGNATURE OF APPLICANT, ATTORNEY OR AGENT

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appln. No:	10/628,709
Appellant:	Atsushi Kono, et al.
Filed:	July 28, 2003
Title:	THERMAL FUSE AND METHOD OF MANUFACTURING FUSE
TC/A.U.:	2835
Examiner:	Anatoly Vortman
Confirmation No.:	6708
Notice of Appeal Filed:	June 2, 2006
Docket No.:	MAT-8450US

SUBSTITUTE APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

In response to the Office Communications dated August 28, 2006, and September 22, 2002, Appellant is submitting this Substitute Appeal Brief for the above-identified application. The Appeal Brief fee was previously paid.

I. REAL PARTY IN INTEREST

The Real Party In Interest in this matter is Matsushita Electric Industrial Co., Ltd.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Appellant, Appellants' legal representative, or Appellants' Assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-28 are pending in the application. Claims 1-28 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Applicants' Admitted Prior Art in view of Kodama *et al.*, U.S. Patent No. 6,403,234. Claims 1-28 also stand rejected under 35 U.S.C. § 103(a) as unpatentable over Applicants' Admitted Prior Art taken alone.

IV. STATUS OF AMENDMENTS

There are no pending, unentered amendments after a Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention relates to a thermal fuse that has a stable fusing temperature and to its method of manufacture. Specification; Title and page 1, lines 4-7; page 2, line 19; and page 5, lines 13-19. The fuse is used for protecting electrical devices. Page 1, lines 4-7. The thermal fuse comprises (1) a fusible alloy including tin, and (2) lead[1] conductors attached to both ends of the fusible alloy by electric welding or laser welding. *Id.*, and page 1, lines 10-17. When the lead conductors are connected to the fusible alloy during manufacture, material from the lead conductors may diffuse into the fusible alloy, changing its composition and, consequently, changing the melting temperature of the thermal fuse. *Id.*, page 1, line 17, and page 2, line 12.

Claims 1 and 10 are independent claims.

Independent Claim 1 is drawn to a thermal fuse comprising the fusible alloy and the lead conductors, in which the lead conductors have surface layers made of metal

including tin as a main substance, and the surface layers have thicknesses not greater than 14μm. *Id.*, page 2, lines 15-19, and claim 1. Figure **1** is a cross sectional view of a thermal fuse of the invention. The thermal fuse comprises lead conductors 12, electrically connected to the ends of fusible alloy 11. *Id.*, page 3, lines 7-14. Fusible alloy 11 comprises tin. *Id.* Lead conductors 12 have surface layers 12a. *Id.* Surface layers 12 are made of metal including tin as a main substance, and thicknesses not greater than 14μm. *Id.* Fusible alloy 11 is coated with flux 13, and sealed in insulating case 14 with hard resin 15. *Id.*, lines 14-22. Figure **2** is a cross section of the thermal fuse at line 2-2 shown in Figure **1**, showing lead conductor 12 with surface layer 12a. *Id.*, page 2, lines 24-25. Figure **3** shows a radial-lead type thermal fuse in which lead connectors 112 have surface layers 112a. *Id.*, page 6, lines 16-22. Lead connectors 112 are connected to fusible alloy 11. *Id.* Figure **4** shows a thin thermal fuse in which lead connectors 22, with surface layers 12a, are connected to fusible alloy 11. *Id.*, page 6, lines 22-26.

Claim 10, the only other independent claim pending in the application, is drawn to a method for producing the thermal fuse. Claim 10. The method comprises preparing the fusible alloy including tin and preparing the lead connectors with the surface layers made of metal including tin as a main substance and having thicknesses not greater than 14μm thereon. Original claim 10, and specification, page 5, line 27, to page 6, line 9. The lead connectors are then connected to the ends of the fusible alloy. *Id.*, page 3, line 26, to page 4, line 2.

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[1] "lead," as "to guide or direct". Not "lead," as the element Pb.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Both rejections of record are to be reviewed on appeal. That is, both the rejection of claims 1-28, all the claims pending in the application, as unpatentable over Applicants' Admitted Prior Art in view of Kodama *et al.*, U.S. Patent No. 6,403,234, and the rejection of claims 1-28 as unpatentable over Applicants' Admitted Prior Art taken alone are to be reviewed on appeal.

VII. ARGUMENT

A. LEGAL STANDARD

Both the rejections of record are rejections under 35 USC § 103(a). Obviousness is analyzed using the four step analysis promulgated in *Graham v. John Deere. Graham v. John Deere,* 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966). When obviousness is based on a combination of references, the references must be analogous art. *In re Clay*, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992). Motivation to combine the references must be shown. *In re Rouffet*, 47 USPQ2d 1453, 1456 (Fed. Cir. 1998); *In re Dembiczak*, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). As long as some motivation or suggestion to combine the references is provided by the prior art as a whole, the references need not be combined for the reasons contemplated by the inventor. *In re Beattie*, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (citing cases). However, a *prima facie* case of obviousness can be rebutted if the applicant can establish (1) the existence of unexpected properties, or (2) that the art in any material respect taught away from the claimed invention. *In re Geisler*, 43 USPQ 1362, 1365 (Fed. Cir. 1997) (citing *In re Malagari*, 182 USPQ 549, 553 (CCPA 1974)).

B. FIRST REJECTION UNDER 35 U.S.C. § 103(A) - APPLICANTS' ADMITTED PRIOR ART (AAPA) IN VIEW OF IN VIEW OF KODAMA

1. Claims 1-28

Claims 1-28, all the claims pending in the application, stand rejected as unpatentable over Applicants' Admitted Prior Art (AAPA) in view of in view of Kodama *et al.*, U.S. Patent No. 6,403,234 ("Kodama").

AAPA, the primary reference, was cited for the general disclosure of the existence and structure of thermal fuses. Office Action of March 8, 2006, page 3, line 11-17. For the AAPA, the Examiner refers to the instant application: Fig. 5; p. 1, lines 10-27; and p. 11, lines 1-12. Office Action of March 8, 2006, page 3, lines 11-12. This citation is only partly correct. There is no page 11 in the specification. The specification, including the claims and the abstract, is only ten (10) pages long.

The Examiner asserts that the AAPA discloses a layer "comprising metal including tin as the main substance (i.e. substantially entirely made of tin)." Office Action of March 8, 2006, page 3, line 14-15. This passage does not generally disclose layers in which tin is the main substance. This is only partly correct. Specifically, what this cited passage discloses is Sn/Pb layers "composed of tin or solder which includes 60 to 65wt% of tin and 40 to 35 wt% of lead." Specification, page 1, lines 13-15. A layer that comprises 60 to 65wt% tin is not substantially entirely made of tin.

For each of the reasons discussed below, the rejection of claims 1-28 as unpatentable over AAPA in view of in view of Kodama should be reversed.

1. Kodama is Not Analogous Art

For a reference to be combined to create a *prima facie* case of obviousness it must be "analogous art." For a reference to be analogous art it must either (1) be from the same field of endeavor, regardless of the problem addressed; or (2) be reasonably pertinent to the particular problem with which the inventor is involved. *In re Clay*, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992).

Kodama and appellants' invention do not address the same problem, and the Examiner has not asserted that they do. Kodama is concerned with the problem of large insertion and withdrawal forces that must be applied when tin-plated connectors are used in, for example, assembly lines for automobiles. Kodama, column 1, lines 32-56. Appellants' invention addresses the problem of variation in the fusing temperature of the fusible alloy in a thermal fuse caused by melting of the plating of the lead conductors during manufacture of the thermal fuse. Specification, page 1, line 18, to page 2, line 12. However, the Examiner's position is that AAPA and Kodama are from the same field of endeavor, "tin covered electrical connectors and devices employing them". Office Action of March 8, 2006, page 3, lines 23-24.

Appellants' position is that Kodama and appellants' invention are not from the same field of endeavor. "Electrical connectors," which includes Kodama, and "thermal fuses," which includes appellants' invention, are two separate and distinct art areas. They have different uses and, consequently different use requirements. Kodama's connectors are used primarily for electrical wiring of automobiles. Kodama, column 1, lines 29-31. They are manually connected on automobile assembly lines and should have minimal insertion force to prevent injury to workers. *Id.*, lines 33-40. As described in

Sugawara, U.S. Patent No. 5,849,424, which also discloses tin plated electrical connectors and is also of record in the file of this application, tin plated connectors are subject to constant insertion and withdrawing and must be highly resistant to abrasion and delamination and should have decreased friction during the insertion and withdrawing process. Sugawara, column 1, lines 10-32.

Appellants' invention is a thermal fuse, not an electrical connector, and so is outside Kodama's field of endeavor. Unlike electrical connectors, thermal fuses are not manually inserted and withdrawn, so "insertion force" is not relevant to their use. Instead, thermal fuses are linked to the electrical circuit in which they are included by lead conductors attached by electric welding or laser welding. Specification, page 1, lines 10-13. Thermal fuses are used to protect various electrical and electronic appliances and electric components, such as transformers, motors, and secondary batteries, from overheating. Specification, page 1, lines 4-7. In order to protect electrical equipment, they need a fusing temperature that has minimum variability. Specification, page 1, line 25, to page 2, line 12.

During prosecution, the Examiner asserted that different use is not characteristic of a different field of endeavor. Advisory Action of August 22, 2005, page 2, lines 11-12. This is legal error. The similarities and differences in structure and function of the disclosed inventions carry great weight in determining whether a reference is analogous art. *See, for example,* MPEP 2141.01(a)(II) (*citing In re Ellis*, 177 USPQ 526, 527 (CCPA 1973)) (emphasis added). In the leading case on non-analogous art, the Federal Circuit found that a reference relating to petroleum production was not analogous art to an invention relating to the storage of refined petroleum products, even though both related

to the petroleum industry. *In re Clay*, 23 USPQ2d 1058 (Fed. Cir. 1992). In making this determination, the Federal Circuit stressed the differences in the conditions of use between the two inventions:

> The PTO argues that Sydansk and Clay's inventions are part of a common endeavor - "maximizing withdrawal of petroleum stored in petroleum reservoirs." However, Sydansk cannot be considered to be within Clay's field of endeavor merely because both relate to the petroleum industry. Sydansk teaches the use of a gel in unconfined and irregular volumes within generally underground natural oil-bearing formations to channel flow in a desired direction; Clay teaches the introduction of gel to the confined dead volume of a man-made storage tank. The Sydansk process operates in extreme conditions, with petroleum formation temperatures as high as 115°C and at significant well bore pressures; Clay's process apparently operates at ambient temperature and atmospheric pressure. Clay's field of endeavor is the storage of refined liquid hydrocarbons. The field of endeavor of Sydansk's invention, on the other hand, is the extraction of crude petroleum.
>
> *In re Clay*, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992).

As is apparent from this passage, the conditions of use are important in defining the field of endeavor. Thus, the mere presence of a tin containing layer in Kodama's connector does not make Kodama analogous art to appellants' invention.

The Examiner also asserts that it would be obvious "to adjust the thickness of said

Sn or Sn alloy surface layers of Kodama to be within the claimed range in order to achieve specific desired insertion force of said lead conductors." Office action of March 8, 2006, page 4, lines 9-11 (emphasis original). As described above, appellants' invention is a thermal fuse, not a connector. The lead conductors are welded to the fusible alloy, not inserted into it. Consequently, "insertion force" is not relevant because the conductors are not inserted into the fusible alloy.

The Examiner has not made the *prima facie* case. Because Kodama is not analogous art, it may not be combined with AAPA to produce a *prima facie* case of obviousness. The rejection of claims 1-28 as unpatentable over AAPA in view of Kodama should be reversed.

2. Kodama Teaches Away for the Invention

Kodama expressly disparages tin-plated connectors:

> However, in connectors formed of Sn plated material, it is noted that a large insertion force must be applied when the connector is connected. In assembly lines for automobiles, the connectors are usually manually connected at present. Therefore, in the case in which the insertion force necessary for the connector is too large, workers on the assembly line are burdened thereby, and it is also possible that work-related health problems will occur.

Kodama, column 1, lines 33-39 (emphasis added).

Kodama expressly teaches that connectors formed of Sn plated material require a

large insertion force, which can cause work-related heath problems.

In addition, the disadvantages of tin-plated connectors are well known in the art. For example, Sugawara, U.S. Patent No. 5,849,424, which is of record in the application, similarly disparages tin-plated connectors. Sugawara expressly discloses two specific disadvantages of tin plated connectors (1) increased friction, and (2) delamination. Sugawara, column 1, lines 26-41.

Both Kodama and the art teach against the use of tin-plating. Therefore, the person of ordinary skill in the art would not be motivated to combine AAPA with Kodama to produce a tin plated surface because Kodama and the art teach the disadvantages of a tin plated surface.

The Examiner has not made the *prima facie* case. A reference that teaches away from an invention cannot be combined with other references to make it obvious. *Winner Int'l Royalty Corp. v. Wang*, 53 USPQ2d 1580, 1582 (Fed. Cir. 2000); *In re Grasselli*, 218 USPQ 769, (Fed. Cir. 1983); *see* also *United States v. Adams*, 383 U.S. 39, 148 USPQ 479, 484 (1966) ([k]nown disadvantages in old devices which would naturally discourage search for new inventions may be taken into account in determining obviousness). Consequently, Kodama can not be combined with AAPA to produce a *prima facie* case of obviousness. For this additional reason, the rejection of claims 1-28 as unpatentable over AAPA in view of Kodama should be reversed.

3. Combination of AAPA and Kodama does not produce Appellants' Invention

Even if Kodama and AAPA are combined, they do not produce appellants' invention. Appellants' claim 1 recites "surface layers made of metal including tin as a

main substance provided on said lead conductors". That is, in appellants' invention the surface layers are on the lead conductors. *See*, for example, specification, Figure 2.

Kodama discloses a four layer structure:

1) a surface layer of reflowed tin or tin alloy;

2) an alloy layer consisting primarily of Sn-Ni formed by diffusion between the surface layer and the intermediate layer;

3. an intermediate layer consisting of a nickel alloy having a Vickers hardness of 450 to 750 Hv;

4. a base metal consisting of copper or a copper alloy.

Kodama, Abstract.

Combination of AAPA and Kodama would produce a thermal fuse in which there were three layers, rather than a single tin containing layer on the lead conductors. Further, Kodama teaches that "A plated material according to the present invention is satisfactory as long as an alloy layer containing Ni exists under the Sn or Sn alloy plating layer at the surface." Kodama, column 2, lines 27-30 (emphasis added). Thus, the person of ordinary skill in the art, having the advantage of the teachings of Kodama, would have no motivation to omit the underlying layers and produce appellants' invention.

The Examiner has not made the *prima facie* case. Combination of the references in the manner proposed by the Examiner does not produce appellants' invention. And

there is no motivation to modify the combination to produce appellants' invention. For this additional reason, the rejection of claims 1-28 as unpatentable over AAPA in view of Kodama should be reversed.

2. Claims 2 and 11

Claim 2 is drawn to a thermal fuse, and claim 11 is drawn to a method of manufacturing a thermal fuse. Each of these claims recites that the surface layers are substantially entirely made of tin.

AAPA discloses surface comprising 60 to 65wt% of tin and 40 to 35wt% of lead. Thus, AAPA does not disclose surface layers substantially entirely made of tin.

The Examiner argues that Kodama teaches the conventionally of plating electrical connectors with tin and tin alloys and relies on "column 1, lines 10+" of Kodama. Office action of March 8, 2006, page 3, lines 18-19. However, as discussed above, column 1, lines 32-45, disclose the disadvantages of these tin plated connectors, thus teaching away from appellants' invention. A reference that teaches away from an invention cannot make it obvious, for this additional reason the rejection of claims 2 and 11 as unpatentable over AAPA in view of Kodama should be reversed.

3. Claims 19-23 and 24-28

Claims 19-23 are each drawn to a thermal fuse, and claims 24-28 are each drawn to a method of manufacturing a thermal fuse. Each of these claims recites a specific range of compositions for the surface layer. The Examiner's position is that:

> It would have been obvious for a person skilled in the arts pertained

> to electrical connectors at the time was the invention was made to supplement tin in said surface layers with a suitable well known material, such as the aforementioned silver and bismuth, in order to achieve desired characteristics of the lead conductors, or desired fusing characteristics of a fuse, since it has been held to be within the general skill of a worker in the art to a select a known material on the basis of its suitability for intended use as a matter of obvious design choice. *In re Leshim*, 125 USPQ 416.
>
> Office action of March 8, 2006, page 5, lines 14-20 (emphasis original).

The Examiner again asserts that appellants' invention is in the field of electrical connectors. As discussed above, appellants' invention is a thermal fuse, not an electrical connector.

The Examiner asserts that it would be obvious to use "suitable well known materials." The Examiner has not shown that the particular alloys recited in claims 19-28 are "suitable well known materials" for this particular application, *i.e.*, surface layers of lead conductors of thermal fuses with stable fusing temperatures. *See, In re Lee*, 61 USPQ 1430, 1432-34 (Fed. Cir. 2002) (agency findings must be supported by the record). Numerous other chemical elements, at wide ranges of concentrations, may be present in alloys. Kodama, for example, discloses that P or B can be diffused into the tin surface layer. Kodama, column 2, lines 37-44; column 3, lines 43-50. Pb, Ag, and Bi are also disclosed as possible components of the surface layer. Kodama, column 3, lines 53-55. As discussed in the instant specification, a surface layer that comprises Pb changes the composition of the fusible alloy and increases the melting temperature, which is undesirable. Specification, page 1, line 26, to page 2, line 12.

The Examiner alleges that Kodama discloses that the surface layers may include copper. Office action of March 8, 2006, page 5, lines 10-11. The passage relied on, Table 10, line 14, of Kodama, discloses the composition of the intermediate layer, not the composition of the surface layer. Therefore, this passage does not support the Examiner's assertion that Kodama disclose copper as a component of the surface layer.

The Examiner also asserts it would be obvious to one having ordinary skill in the arts pertained to electrical connectors at the time the invention was made to select any appropriate ranges for said silver, copper and bismuth to achieve the desired properties. Office action of March 8, 2006, page 6, lines 1-7. Nothing in Kodama provides the person of ordinary skill in the art with any guidance as to which of the disclosed elements to select to alloy with Sn, and in what amounts, for the surface layer to produce a thermal fuse that has a stable fusing temperature. The Examiner has not explained by the person of ordinary skill in the art would choose to optimize Ag and Bi, which are disclosed by Kodama as possible components of the surface layer, and Cu, which is not disclosed by Kodama as a possible component of the surface layer, rather than, for example, Pb, P, or B, which are also taught by Kodama, or any of the other elements that are possible components of alloys.[2] This rejection relies on appellants' disclosure for this teaching and is, thus, improper hindsight reconstruction of the invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 220 USPQ 303, 312-313 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

For these additional reasons, the Examiner has not made the *prima facie* case.

[2] Sugawara, U.S. Patent No. 5,849,424, for example, previously relied on by the Examiner, discloses over two dozen elements that may be present in copper alloys. Sugawara, column 3, lines 47-57; *see also, Id.*, column 5, lines 4-37.

The Examiner has not shown the compositions recited in claims 19-28 are suitable well known materials for use in the surface layers of the lead conductors of thermal fuses. Further, the Examiner has not shown any motivation or teaching that would lead the person of ordinary skill in the art to select the specific compositions recited in the claims for the surface layer of lead conductors to produce a thermal fuse with a stable fusing temperature. For this additional reason, the rejection of claims 19-28 as unpatentable over AAPA in view of Kodama should be reversed.

4. Method Claims 10-18 and 24-28

Claims 10-18 and 24-28 are method claims, drawn to a method for producing the thermal fuse. The Examiner rejected these claims because "the method steps recited in the claims are inherently necessitated by the device structure as taught by the combination of AAPA and Sugawara." Office Action of March 8, 2006, page 6, lines 8-9 (emphasis added).

The rejection based on the combination of AAPA and Sugawara was the previous rejection, which was withdrawn in view of the Appeal Brief filed November 10, 2005. Office action of March 8, 2006, page 2, lines 3-8. Therefore, this alleged rejection of claims 10-18 and 24-28 on the combination of AAPA and Sugawara is erroneous and should be reversed.

Further, the Examiner has not placed on the record any support for the assertion that the rejection is "inherently necessitated" by the combination of AAPA with Sugawara, Kodama, and/or other reference or references. *See, In re Lee*, 61 USPQ 1430, 1432-34 (Fed. Cir. 2002) (agency findings must be supported by the record). The Examiner has

not explained how the alleged disclosure of a device structure can inherently necessitate rejection of fourteen different method claims. For this additional reason, the rejection of claims 10-18 and 24-28 should be reversed.

C. SECOND REJECTION UNDER 35 U.S.C. § 103(A) - APPLICANTS' ADMITTED PRIOR ART (AAPA)

1. Claims 1-28

Claims 1-28 were rejected as unpatentable over AAPA. The Examiner's position with respect to AAPA taken alone is:

> Alternatively, it would be obvious to a person of ordinary skill in electrical arts pertained to electrical connectors at the time the invention was made, to make tin surface layers of AAPA having thicknesses not greater than 14μm and not less than 1μm, in order to achieve desired fusing characteristics of a fuse or desired insertion force of the lead conductors, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e. in AAPA), discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Office Action of March 8, 2006, page 5, lines 3-9 (emphasis original).

As been previously pointed out, appellants' invention is a thermal fuse, not an electrical connector. The lead conductors are welded, not inserted, so "desired insertion force" is meaningless in the context of appellants' invention. Therefore, the knowledge of

those skilled in the art of electrical connectors is not relevant to this rejection.

As discussed above, AAPA was cited for the general disclosure of the existence and structure of thermal fuses. Office Action of March 8, 2006, page 3, line 11-17. The Examiner asserts that the AAPA discloses a layer "comprising metal including tin as the main substance (i.e. substantially entirely made of tin)." Office Action of March 8, 2006, page 3, line 14-15. Specifically, what the cited passage discloses is Sn/Pb layers "composed of tin or solder which includes 60 to 65wt% of tin and 40 to 35 wt% of lead." Specification, page 1, lines 13-15.

AAPA does not disclose including tin as a main substance in which the surface layers have thicknesses not greater than 14μm. The Examiner argues that a *prima facie* case of unpatentability exists because discovering the optimum or workable ranges involves only routine skill in the art. However, a *prima facie* case of obviousness can be rebutted by the existence of unexpected properties. As shown in Fig. 6, a sample outside the scope of claim 1, in which the surface layer was 100% tin and which had a thickness of 18μm (Sample 13), had a Fusing Temperature Variation of 1.3°C among 10 samples. See, specification, page 4, line 25, to page 5, line 6, for a description of the experiment. In contrast, two samples that are within the scope of claim 1, in which the surface layers were 100% tin and thicknesses of 2μm and 14μm (Sample 1 and 2, respectively), each had a Fusing Temperature Variation of only 0.6°C among 10 samples. Sample 14, in which the surface layer comprises 37% lead and, thus, falls within AAPA, the closest prior art cited by the Examiner, has a Fusing Temperature Variation of 1.2°C among 10 samples.

This 50% or more reduction in Fusing Temperature Variation when the thickness

of the surface layer is not greater than 14μm thick was unexpected. Nothing in AAPA discloses or suggests that the Fusing Temperature Variation can be reduced by making the thickness of the surface layer not greater than 14μm. Even if the Examiner has made the *prima facie* case, it has been overcome by a showing of unexpected results.

2. Claims 2 and 11

Claim 2 is drawn to a thermal fuse, and claim 11 is drawn to a method of manufacturing a thermal fuse. Each of these claims recites that the surface layers are substantially entirely made of tin. AAPA discloses surface comprising 60 to 65wt% of tin and 40 to 35wt% of lead. Because the surface layer comprises 40 to 35 wt% of lead, AAPA does not disclose surface layers substantially entirely made of tin.

Although the Examiner has argued that Kodama teaches the conventionally of plating electrical connectors with tin and tin alloys, this alternative rejection is based on AAPA by itself, not on the combination of AAPA and Kodama. The disclosure of Kodama is not relevant to this rejection.

The Examiner has not made the *prima facie* case. The Examiner has not provided any motivation or other explanation as to why the person of ordinary skill in the art in the filed of thermal fuses would modify the disclosure of AAPA, a surface layer comprising 60 to 65wt% of tin and 40 to 35wt% of lead, to a surface layer substantially entirely made of tin in order to produce a thermal fuse with a stable fusing temperature. For this additional reason the rejection of claims 2 and 11 as unpatentable over AAPA should be reversed.

3. Claims 19-23 and 24-28

Claims 19-23 are each drawn to a thermal fuse, and claims 24-28 are each drawn to a method of manufacturing a thermal fuse. Each of these claims recites a specific range of compositions for the surface layer.

The Examiner has not made the *prima facie* case with respect to copper in the surface layers. The Examiner's position, discussed above, is that copper is disclosed by Kodama. Office action of March 8, 2006, page 5, lines 10-20. However, because this alternative rejection is based on AAPA by itself, not on the combination of AAPA and Kodama, the disclosure of Kodama is not relevant to this rejection.[3] The AAPA does not mention copper. The rejection of claims 4, 6, 13, 15, 20, 22, 23, 25, 27, and 28, which each recite a surface layer that comprises copper, as unpatentable over AAPA should be reversed.

The Examiner has not made the *prima facie* case with respect to the presence of silver and/or bismuth in the surface layers. As discussed above, the Examiner has cited the fact that silver and bismuth are mentioned in Kodama. However, this rejection is based on AAPA by itself, not on the combination of AAPA and Kodama, so the disclosure of Kodama is not relevant to this rejection. The Examiner has not placed on the record any evidence that silver and bismuth are "suitable <u>well known</u> materials" (emphasis original) for use in this application, *i.e.,* for use in the surface layers of the lead conductors of thermal fuses to provide thermal fuses that have a stable fusing temperature. *See, In re Lee,* 61 USPQ 1430, 1432-34 (Fed. Cir. 2002) (agency findings

[3] As discussed above, the passage of Kodama relied on by the Examiner discloses copper as a component of the intermediate layer, not as a component of the surface layer.

must be supported by the record). For this additional reason, the rejection of claims 3, 5, 7, 12, 14, 16, 19, 21-24, and 26-28, which each recite a surface layer that comprises silver and/or bismuth should be reversed.

4. Method Claims 10-18 and 24-28

Although the Examiner stated that claims 1-28 were rejected as unpatentable of AAPA taken alone, the only statement with respect to method claims 10-18 and 24-28 was that "the method steps recited in the claims are inherently necessitated by the device structure as taught by the combination of AAPA and Sugawara." Office Action of March 8, 2006, page 6, lines 8-9. There was no explanation as to why these claims were unpatentable over AAPA taken alone.

The Examiner has not made the *prima facie* case. The Examiner has not explained why the method claims are unpatentable over AAPA taken alone. For this additional reason, the rejection of claim 10-18 and 24-28 as unpatentable over AAPA taken alone should be reversed.

D. RESPONSE TO EXAMINER'S RESPONSE TO ARGUMENTS

This brief is in response to a First Action Final Rejection, which cited a new reference and included two new grounds of rejection, following reopening of prosecution after appellants' filed an Appeal Brief. Office action of March 8, 2006, page 2, lines 3-8. Therefore, there is no Examiner's "Response to Arguments" to which to respond. *Id.*, page 6, lines 10-12.

E. CONCLUSION

For the reasons discussed above, the rejection of claims 1-28 of the instant

application as unpatentable over AAPA in view of Kodama should be reversed and such action is earnestly solicited.

Respectfully Submitted,

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Enclosure: Claims Appendix
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The Assistant Commissioner is hereby authorized to charge payment to Deposit Account No. **18-0350** of any fees associated with this communication.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Mail Stop Appeal Brief - Patents, Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on October 13, 2006.

Beth Johnson

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VIII. APPENDIX OF CLAIMS

1. A thermal fuse comprising:

a fusible alloy including tin;

a couple of lead conductors connected to both ends of said fusible alloy, respectively; and

surface layers made of metal including tin as a main substance provided on said lead conductors, respectively, said surface layers having thicknesses not greater than 14μm.

2. The thermal fuse according to claim 1, wherein said surface layers are substantially entirely made of tin.

3. The thermal fuse according to claim 1, wherein said surface layers include silver.

4. The thermal fuse as defined in claim 3, wherein said surface layers include copper.

5. The thermal fuse according to claim 4, wherein said surface layers include bismuth.

6. The thermal fuse according to claim 1, wherein said surface layers include copper.

7. The thermal fuse according to claim 1, wherein said surface layers include bismuth.

8. The thermal fuse according to claim 1, wherein said surface layers have composition having no orientation.

9. The thermal fuse according to claim 1, wherein said thicknesses of said surface layers are not less than 1μm.

10. A method of manufacturing a thermal fuse, comprising the steps of:

preparing a fusible alloy including tin, and a couple of lead conductors having surface layers formed thereon, respectively, the surface layers being made of metal including tin as a main substance and having thicknesses not greater than 14μm; and

connecting the lead conductors to both ends of the fusible alloy, respectively.

11. The method according to claim 10, wherein the surface layers are substantially entirely made of tin.

12. The method according to claim 10, wherein the surface layers include silver.

13. The method according to according to claim 12, wherein the surface layers include copper.

14. The method according to claim 13, wherein the surface layers include bismuth.

15. The method according to claim 10, wherein the surface layers include copper.

16. The method according to claim 10, wherein the surface layers include bismuth.

17. The method according to claim 10, wherein the surface layers have composition having no orientation.

18. The method according to in claim 10, wherein the thicknesses of the surface layers are not less than 1μm.

19. The thermal fuse according to claim 1, wherein the surface layers comprise 95 to 99 wt.% tin and 1 to 5 wt.% silver.

20. The thermal fuse according to claim 1, wherein the surface layers comprise

97 to 99.5 wt.% tin and 0.5 to 3 wt.% copper.

21. The thermal fuse according to claim 1, wherein the surface layers comprise 96 to 99.7 wt.% tin and 0.3 to 4 wt.% bismuth.

22. The thermal fuse according to claim 1, wherein the surface layers comprise 95 to 97 wt.% tin, 2 to 5 wt.% silver and 0.3 to 1.5 wt.% copper.

23. The thermal fuse according to claim 1, wherein the surface layers comprise 95 to 97 wt.% tin, 2 to 4 wt.% silver, 0.3 to 1.5 wt.% copper and 0.3 to 1 wt.% bismuth.

24. The method according to claim 10, wherein the surface layers comprise at least 95 to 99 wt.% tin and 1 to 5 wt.% silver.

25. The method according to claim 10, wherein the surface layers comprise at least 97 to 99.5 wt.% tin and 0.5 to 3 wt.% copper.

26. The method according to claim 10, wherein the surface layers comprise at least 96 to 99.7 wt.% tin and 0.3 to 4 wt.% bismuth.

27. The method according to claim 10, wherein the surface layers comprise at least 9.5 to 97 wt.% tin, 2 to 5 wt.% silver and 0.3 to 1.5 wt.% copper.

28. The method according to claim 10, wherein the surface layers comprise at least 95 to 97 wt.% tin, 2 to 4 wt.% silver, 0.3 to 1.5 wt.% copper and 0.3 to 1 wt.% bismuth.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None